

APPLICATION SERIAL NO. 10/785,218

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REMARKS

In the Office action dated December 30, 2006, pending claims 1-26 were rejected. The rejection is traversed, without amendment to the claims. Further examination and reconsideration respectfully are requested.

Examiner's Acceptance of Applicants' Drawings

Applicants are grateful for the Examiner's acceptance of the drawings filed on February 24, 2004.

Claim Rejections - 35 USC § 102

On page 2 of the Office Action, claims 1 and 17 are rejected under 35 USC §102(e) as being anticipated by U.S. Patent No. 6,917,631 ("Richardson").

To anticipate a claim, the reference must teach every element of the claim. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Therefore, all claim elements, and their limitations, must be found in the prior art reference to maintain a rejection based on 35 U.S.C. §102. Applicants respectfully submit that Richardson does not teach every element of claims 1 and 17, and therefore fails to anticipate claims 1 and 17.

Richardson discloses the problem of nonlinear distortion in a pulsed laser source, which arises when the peak pulse powers are too high. Richardson teaches overcoming this problem by stretching the pulse before amplification, then compressing the pulse after amplification. (column 2, lines 17-22) This solution is shown schematically in the

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block diagram of Fig. 1, and is seen by tracing the beam path toward the final output 150: a pulse passes through a pulse stretcher 128, then through various pre-amplifiers 68a and 68b and gating devices 132a and 132b, then through a fiber power amplifier 96, and finally, through a pulse compressor 146, before reaching the final output 150.

Note that the beam path in Richardson (Fig. 1) has both an amplifier 96 and a pulse compressor 146 in sequence. They are adjacent optical elements, and both are part of a single beam path through the system of Richardson.

In contrast, claim 1 recites a first beam path, which has a pulse shortening element, and a second beam path, which amplifies the pulse. In particular, the pulse shortening element is "disposed in the first beam path and absent from the second beam path". Because Richardson has only a single beam path, the pulse shortening element of Richardson cannot be "disposed in the first beam path and absent from the second beam path", as recited by claim 1.

As a result, not all the elements of claim 1 are found in Richardson, and Richardson fails to anticipate claim 1.

A similar argument applies for claim 17. Richardson cannot have "a pulse shortening element disposed in the resonator arm and excluded from the gain arm", as recited by claim 17, because the fiber power amplifier 96 and pulse compressor 146 are adjacent optical elements in the single beam path through Richardson.

As a result, not all the elements of claim 17 are found in Richardson, and Richardson fails to anticipate claim 17.

It should be noted that the Examiner's characterization of the system of Richardson, as described on pages 2 and 3 of the Office Action, is incorrect. The Examiner refers to Fig. 2 of Richardson, which shows in detail the laser oscillator 10, the first block element in the schematic beam path of Fig. 1. The laser oscillator 10 has two

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mirrors (elements 22 and 20 in Fig. 2) that define the ends of a cavity that produces pulses (column 8, line 52). In the language of claim 1, the "first beam path" may be disposed between mirror 20 and saturable absorber mirror 22. In the language of claim 17, the "resonator cavity" may also be disposed between mirror 20 and saturable absorber mirror 22.

However, the Examiner erroneously states on page 2 of the Office Action that elements 21 and 54 in Fig. 2 both define a "second beam path for amplifying the short light pulse to obtain at least one high power short light pulse" (in the language of claim 1), and form a "gain arm" (in the language of claim 17). Neither of these characterizations is correct. Element 21 is a photodiode, which receives a first laser output 38 after it has left the cavity (column 8, line 67), and element 54 is a fiber coupler, which receives a third laser output 44 after it has left the cavity (column 9, line 7) and directs it as input to the pulse selector 52 (column 9, lines 36-39). There is no gain or amplification whatsoever between elements 21 and 54. In addition, there is no perceptible cavity that can be bounded by these elements, because the light exits the cavity without any reflected portion; note the directional arrows on the laser outputs in Fig. 2.

Furthermore, the switch in Richardson, formed by the first polarizing beam splitter 36 and the optical fiber 12 (column 9, lines 11-15), cannot be "a switch for directing the short light pulse from the first beam path into the second beam path" as recited in claim 1, because there is no second beam path in Fig. 2 of Richardson. Likewise, the switch of Richardson cannot "controllably [select] between the resonator arm and the gain arm" as recited in claim 17, because there is no gain arm in Fig. 2 of Richardson.

Accordingly, neither claim 1 nor claim 17 is anticipated by Richardson.

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Claim Rejections - 35 USC § 103

On page 3 of the Office Action, claims 2-7, 13-16 and 24-26 are rejected under 35 U.S.C. §103(a) as being unpatentable over Richardson in view of Wundke.

The Applicants assert that independent claims 1, 24 and 26 are not unpatentable over Richardson in view of Wundke, and therefore, dependent claims 2-7, 13-16 and 25, which depend from independent claims 1 and 24, are also not unpatentable over Richardson in view of Wundke.

Three criteria must be met to establish a *prima facie* case of obviousness. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference. Second, there must be a reasonable expectation of success. Finally, the prior art reference, or combination of references, must teach or suggest all the claim limitations. MPEP § 2142. Applicants respectfully traverse the rejection since the prior art fails to disclose all the claim limitations and there would be no motivation to combine the references as proposed by the Examiner.

Richardson discloses the problem of nonlinear distortion in a pulsed laser source, which arises when the peak pulse powers are too high. Richardson teaches overcoming this problem by stretching the pulse before amplification, then compressing the pulse after amplification. (column 2, lines 17-22) This solution is shown schematically in the block diagram of Fig. 1, and is seen by tracing the beam path toward the final output 150: a pulse passes through a pulse stretcher 128, then through various pre-amplifiers 68a and 68b and gating devices 132a and 132b, then through a fiber power amplifier 96, and finally, through a pulse compressor 146, before reaching the final output 150.

Note that the beam path in Richardson (Fig. 1) has both an amplifier 96 and a pulse compressor 146. They are adjacent optical elements, and both are part of a single beam path through the system of Richardson.

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There is no teaching or suggestion in Richardson to amplify the pulse in a beam path that excludes the pulse shortening element, as recited in claim 1.

Wundke discloses the use of PbS quantum-dot-doped glasses for use in generating short pulses. Wundke does not teach or suggest amplifying the pulse in a beam path that excludes the pulse shortening element, as recited in claim 1.

Likewise, the combination of Richardson and Wundke also fails to teach or suggest amplifying the pulse in a beam path that excludes the pulse shortening element, as recited in claim 1. It will be appreciated that the combination of Richardson and Wundke still suffers the disadvantage identified by the Applicants in Paragraph [0017], a disadvantage overcome by the Invention of claim 1. Accordingly, claim 1 is not obvious over Richardson in view of Wundke.

Dependent claims 2-7 and 13-16, which are dependent from independent claim 1, were also rejected under 35 U.S.C. §103(a) as being unpatentable over Richardson in view of Wundke. While Applicants do not acquiesce with the particular rejections to these dependent claims, it is believed that these rejections are moot in view of the remarks made in connection with independent claim 1. These dependent claims include all of the limitations of the base claim and any intervening claims, and recite additional features which further distinguish these claims from the cited references. Therefore, dependent claims 2-7 and 13-16 are also in condition for allowance.

Regarding claim 24, there is nothing in Richardson or Wundke, taken alone or in combination, to teach or suggest "shortening the light pulse in the first beam path", "amplifying the short light pulse in the second beam path", wherein "the passive pulse shortening element [is] absent from the second beam path". Richardson teaches using a single beam path for both shortening and amplifying pulses, and Wundke does not teach or suggest using different or partially different beam paths. Therefore, because not all the elements of claim 24 are taught or suggested by Richardson or Wundke, taken alone or in combination, claim 24 is not obvious in view of Richardson and Wundke.

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Dependent claim 25, which is dependent from independent claim 24, was also rejected under 35 U.S.C. §103(a) as being unpatentable over Richardson in view of Wundke. While Applicants do not acquiesce with the particular rejections to this dependent claim, it is believed that these rejections are moot in view of the remarks made in connection with independent claim 24. This dependent claim includes all of the limitations of the base claim, and recites additional features which further distinguish this claim from the cited references. Therefore, dependent claim 25 is also in condition for allowance.

Regarding claim 26, there is nothing in Richardson or Wundke, taken alone or in combination, to teach or suggest "the gain cavity excluding the saturable absorber". Richardson teaches using a single beam path for both the gain cavity and the saturable absorber (22 in Fig. 2 of Richardson), and Wundke does not teach or suggest excluding the saturable absorber from the gain cavity. Therefore, because not all the elements of claim 26 are taught or suggested by Richardson or Wundke, taken alone or in combination, claim 26 is not obvious in view of Richardson and Wundke.

On page 7 of the Office Action, claims 8-12 and 22-23 are rejected under 35 U.S.C. §103(a) as being unpatentable over Richardson in view of Wundke and further in view of U.S. Patent No. 3,879,686 ("Milam").

The Applicants assert that independent claims 1 and 22 are not unpatentable over Richardson in view of Wundke and further in view of Milam, and therefore, dependent claims 8-12 and 23, which depend from independent claims 1 and 22, are also not unpatentable over Richardson in view of Wundke and further in view of Milam.

Regarding claim 1, the argument above shows that the combination of Richardson and Wundke also fails to teach or suggest amplifying the pulse in a beam path that excludes the pulse shortening element, as recited in claim 1. The Applicants assert that this claim element is also not taught or suggested by Milam.

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Milam discloses a system for producing laser pulses, which is based on a Michelson Interferometer. The interferometer has two arms, denoted by path lengths "x" and "y" in FIGs. 1 and 2. Each arm in the interferometer begins at a single beam splitter 32 and terminates in a 100% reflective mirror 20 and 22. The system of Milam has a pulse shortening element, Q-switch 38, which is common to both arms of the interferometer.

In contrast, claim 1 recites a first beam path, which has a pulse shortening element, and a second beam path, which amplifies the pulse. In particular, the pulse shortening element is "disposed in the first beam path and absent from the second beam path". Because the pulse shortening element of Milam is common to both arms of the interferometer, the pulse shortening element of Milam cannot be "disposed in the first beam path and absent from the second beam path", as recited by claim 1.

Accordingly, the element of claim 1 that is not taught or suggested by Richardson or Wundke, taken alone or in combination, is also not taught or suggested by Milam or by any combination of the three references. Therefore, claim 1 is not unpatentable over Richardson in view of Wundke and further in view of Milam.

Dependent claims 8-12, which are dependent from independent claim 1, were also rejected under 35 U.S.C. §103(a) as being unpatentable over Richardson in view of Wundke and further in view of Milam. While Applicants do not acquiesce with the particular rejections to these dependent claims, it is believed that these rejections are moot in view of the remarks made in connection with independent claim 1. These dependent claims include all of the limitations of the base claim and any intervening claims, and recite additional features which further distinguish these claims from the cited references. Therefore, dependent claims 8-12 are also in condition for allowance.

Regarding claim 22, there are several elements not taught or suggested by the combination of references. Milam is the only reference of the three cited references that

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has three high reflectivity mirrors (elements 16, 20 and 22 in FIG. 1). In the common beam path segment of Milam, there is a laser source 12, a Q-switch 38, and a switch 40. The system of Milam has no active mode locker, as recited by claim 22. The system of Milam also has no passive mode locker, as recited by claim 22. In addition, the system of Milam has no cavity dumper, as recited by claim 22. Furthermore, the switch 40 of Milam is not disposed at a first end of the common beam path segment, as recited by claim 1; rather the common beam path segment of Milam extends from a beam splitter 32, which has no switching capabilities.

Of these elements recited by claim 22, but not found in Milam, there is no motivation provided by either Richardson or Wundke to add any of them to the system of Milam. The system of Milam relies on a Michelson interferometer to produce short laser pulses, where the duration of the pulse may be controlled by adjusting the path length difference between the interferometer arms. One of ordinary skill in the art would not add either a passive or active mode locker to the system of Milam, both of which help produce pulses of a non-adjustable duration.

In addition, the switch of Milam may turn the beam on and off, or adjust the phase of the beam, but cannot switch the beam from one arm to the other. The beam splitter of Milam is a typical amplitude beam-splitter, and FIG. 3 of Milam shows results for the case of a 50/50 beam splitter. There is no motivation to switch the beam from one arm to the other, because Interferometers rely on interference properties that arise from having light propagate down both arms simultaneously. Indeed, there is no interference if light travels down only one arm of the interferometer.

Accordingly, the elements of claim 22 that are not present in Milam are not taught or suggested by any of Milam, Richardson and Wundke, taken alone or in combination. Therefore, claim 22 is not unpatentable over Richardson in view of Wundke and further in view of Milam.

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Dependent claim 23, which is dependent from independent claim 22, was also rejected under 35 U.S.C. §103(a) as being unpatentable over Richardson in view of Wundke and further in view of Milam. While Applicants do not acquiesce with the particular rejections to this dependent claim, it is believed that these rejections are moot in view of the remarks made in connection with independent claim 22. This dependent claim includes all of the limitations of the base claim, and recites additional features which further distinguish this claim from the cited references. Therefore, dependent claim 23 is also in condition for allowance.

On page 9 of the Office Action, claims 18-21 are rejected under 35 U.S.C. §103(a) as being unpatentable over Richardson in view of Milam.

The Applicants assert that independent claim 17 is not unpatentable over Richardson in view of Milam, and therefore, dependent claims 18-21, which depend from independent claim 17, is also not unpatentable over Richardson in view of Milam.

As stated above, Richardson cannot have "a pulse shortening element disposed in the resonator arm and excluded from the gain arm", as recited by claim 17, because the fiber power amplifier 96 and pulse compressor 146 are adjacent optical elements in the single beam path through Richardson. This element is not taught or suggested by Milam, or by Richardson and Milam, taken alone or in combination.

Because not all the elements of claim 17 are taught or suggested by Richardson or Milam, taken alone or in combination, claim 17 is not unpatentable over Richardson in view of Milam.

Dependent claims 18-21, which are dependent from independent claim 17, were also rejected under 35 U.S.C. §103(a) as being unpatentable over Richardson in view of Milam. While Applicants do not acquiesce with the particular rejections to these dependent claims, it is believed that these rejections are moot in view of the remarks made in connection with independent claim 17. These dependent claims include all of

the limitations of the base claim and any intervening claims, and recite additional features which further distinguish these claims from the cited references. Therefore, dependent claims 18-21 are also in condition for allowance.

Conclusion

In view of the foregoing amendments, it is believed that the application is now in condition for allowance. Applicants respectfully request favorable reconsideration and the timely issuance of a Notice of Allowance. If a telephone conference would be helpful in resolving any issues concerning this communication, please contact the undersigned at (952) 253-4114.

Respectfully submitted,

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